CLAIMS

1. A chemical processing device for conducting a chemical process comprising:

a plurality of subsystem modules operable in parallel that execute at least a part of a process, each such module comprising an elongated reactor chambers to perform a process, said subsystem module having first and second ends, such ends having apertures therein for admitting and releasing process fluids;

at least one manifolds connected to one end of each of such plurality of modules for conducting at least one fluid stream between a first one of said process spaces and a second one of said process spaces of each such module;

at least one fluid flow controller for controlling the flow of process fluids through the manifold.

2. The device of embodiment 1 wherein the chemical process is performed in a plurality of sub-processes, said plurality of subsystem modules each comprises at least two elongated reactor chambers one of said elongated reactor chambers performing a first one of said subprocesses therein and the other performing another subprocess therein.

3. The device of embodiment 2 wherein said device comprises a second manifold connected to the other end of each of said subsystem modules for receiving process fluids from a fluid source and distributing said fluids among the subsystem modules;

4. The device of embodiment 3 wherein at least a portion of one of said at least two chambers is contained within the other of said at least two chambers.

5. The device of embodiment 4 wherein said at least two elongated reactor chambers are formed in the interior of elongated tubular members.

6. The device of embodiment 5 wherein at least one of said elongated tubular members is contained at least in part within said other elongated tubular member.

7. The device of embodiment 6 wherein said tubular members have a generally circular cross section and wherein they are mounted between the end blocks in generally coaxial relation to one another.

8. The device of embodiment 7 wherein fluid streams from said subsystem modules are combined in fluid channels in at least one of said manifolds.

9. The device of embodiment 3 wherein the output of the device is controlled by selectively controlling the valves to change the operational status of at least one of said subsystem modules in response to demand, whereby the output of the device can be throttled while allowing the subsystem modules to function generally at a desired output level.

10. The device of embodiment 7 wherein the material and wall thickness of the tubular members are selected to provide a desired level of heat transfer from one of said at least two reactor chambers to the other of such chambers.

11. The device of embodiment 10 wherein the process conducted within the process conducted in the device comprises steam reforming of a hydrocarbon to produce an output stream enriched in hydrogen, said output stream being connected to a hydrogen fuel cell, and wherein said control comprises at least one sensor selected from the group consisting of hydrogen sensors and fuel cell electrical output sensors, each such sensor being connected to control logic circuitry for passing an output signal to such control logic circuitry, said control logic circuitry producing an output signal for operating said valve in response to said output signal.

12. The device of embodiment 2 wherein the controller further includes a sensor for providing an output and wherein the valve is operated based on the sensor output.

13. The device of embodiment 3 wherein the subsystem modules comprise a plurality of nested tubes.

14. The device of embodiment 2 wherein the subsystem modules comprise a plurality of nested tubes.

15 The device of embodiment 2 where said control consists of one or more arrays of valves.

16. The device of embodiment wherein processes selected from the group consisting of heat exchange, flow mixing, and flow splitting are carried out in at least one of said manifolds.

17. The device of embodiment 3 wherein at least one process stream is divided into a plurality of streams, the flow in said streams being independently controlled by the control, at least one of such streams being further divided for communication with a plurality of such subsystem modules.

18. The embodiment of embodiment 9 wherein the valves are actuated by an actuation selected from the group consisting of shaped memory alloy actuation, piezoelectric actuation, thermopneumatic actuation, electrostatic actuation and actuation by temperature changes of a junction of two dissimilar metals.

19. The embodiment of embodiment 3 wherein at least one end blocks comprises a plurality of laminates having channels therein for communicating fluids to and from the reactors of each of a plurality of subsystem modules.